```
1. Serializable]
2.    [SqlUserDefinedType(Format.Structured, MaxByteSize=8000)]
3.    public class BaseItem: INullable
4.    {
5.          [SqlUdtField(IsNullable=false)]
6.          private SqlGuid m_ID;
7.
8.          [SqlUdtField(MaxSize=128, IsFixedLength=false)]
9.          private SqlString m_Name;
10.
11.         [SqlUdtProperty(FieldName="m_ID")]
12.         public SqlGuid ID
13.         {
14.               get
15.               {
16.                     return m_ID;
17.               }
18.               set
19.               {
20.                     this.m_ID = value;
21.               }
22.         }
23.
24.         [SqlUdtProperty(FieldName="m_Name")]
25.         public SqlGuid Name
26.         {
27.               get
28.               {
29.                     return m_Name;
30.               }
31.               set
32.               {
33.                     this.m_Name = value;
34.               }
35.         }
36.
37.         [SqlUdtField(IsNullable=true)]
38.         public MultiSet<PropertyAssociation> Properties;
39.
40.         #region UDT boilerplate
41.         public BaseItem()
42.         {
43.               this.ID = new SqlGuid(Guid.NewGuid());
44.         }
45.         public override string ToString()
46.         {
47.               return "ID " + this.ID;
48.         }
49.         [SqlUdtField]
50.         protected SqlBoolean m_IsNull = SqlBoolean.False;
51.         public bool IsNull { get { return this.m_IsNull.Value; } }
52.         public static BaseItem Null
53.         {
54.               get
55.               {
56.                     BaseItem s = new BaseItem();
57.
58.                     s.m_IsNull = SqlBoolean.True;
59.                     return s;
60.               }
61.         }
62.         public static BaseItem Parse(SqlString s)
63.         {
64.               return new BaseItem();
65.         }
66.         #endregion
67.    }
```

Fig. 1

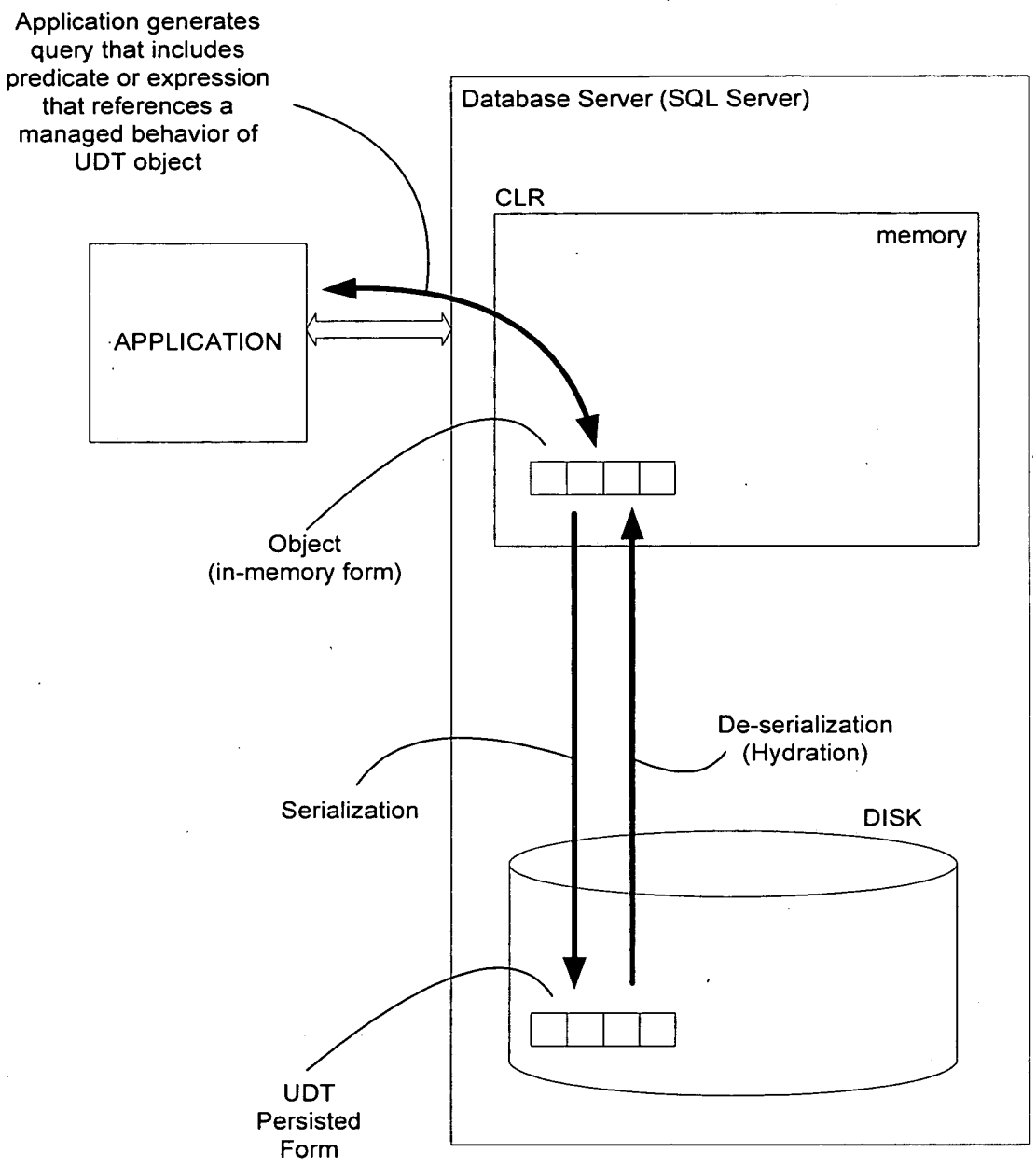

Application generates query that includes predicate or expression that references a managed behavior of UDT object
Database Server (SQL Server)
CLR
memory
APPLICATION
Object (in-memory form)
De-serialization (Hydration)
Serialization
DISK
UDT Persisted Form

Fig. 2

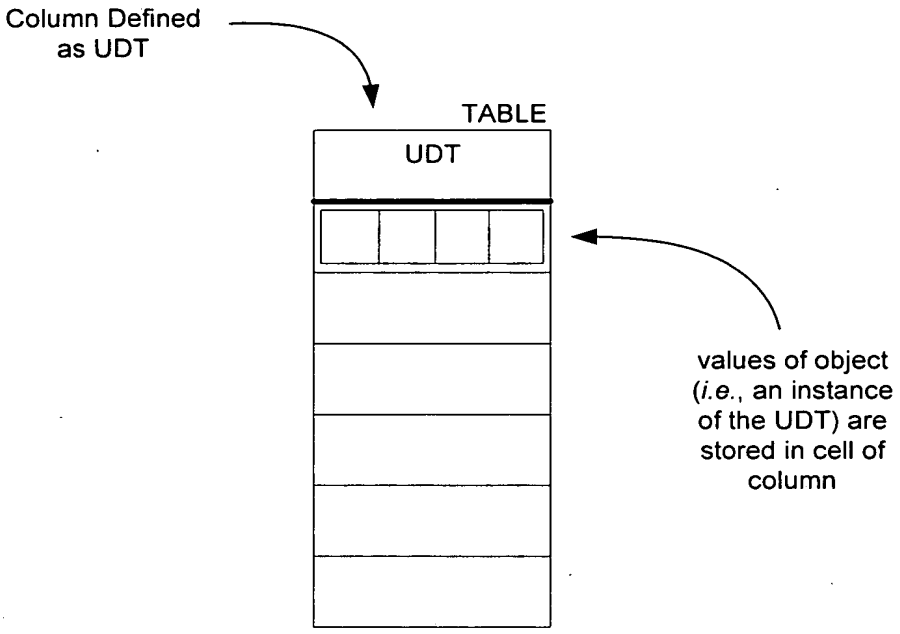
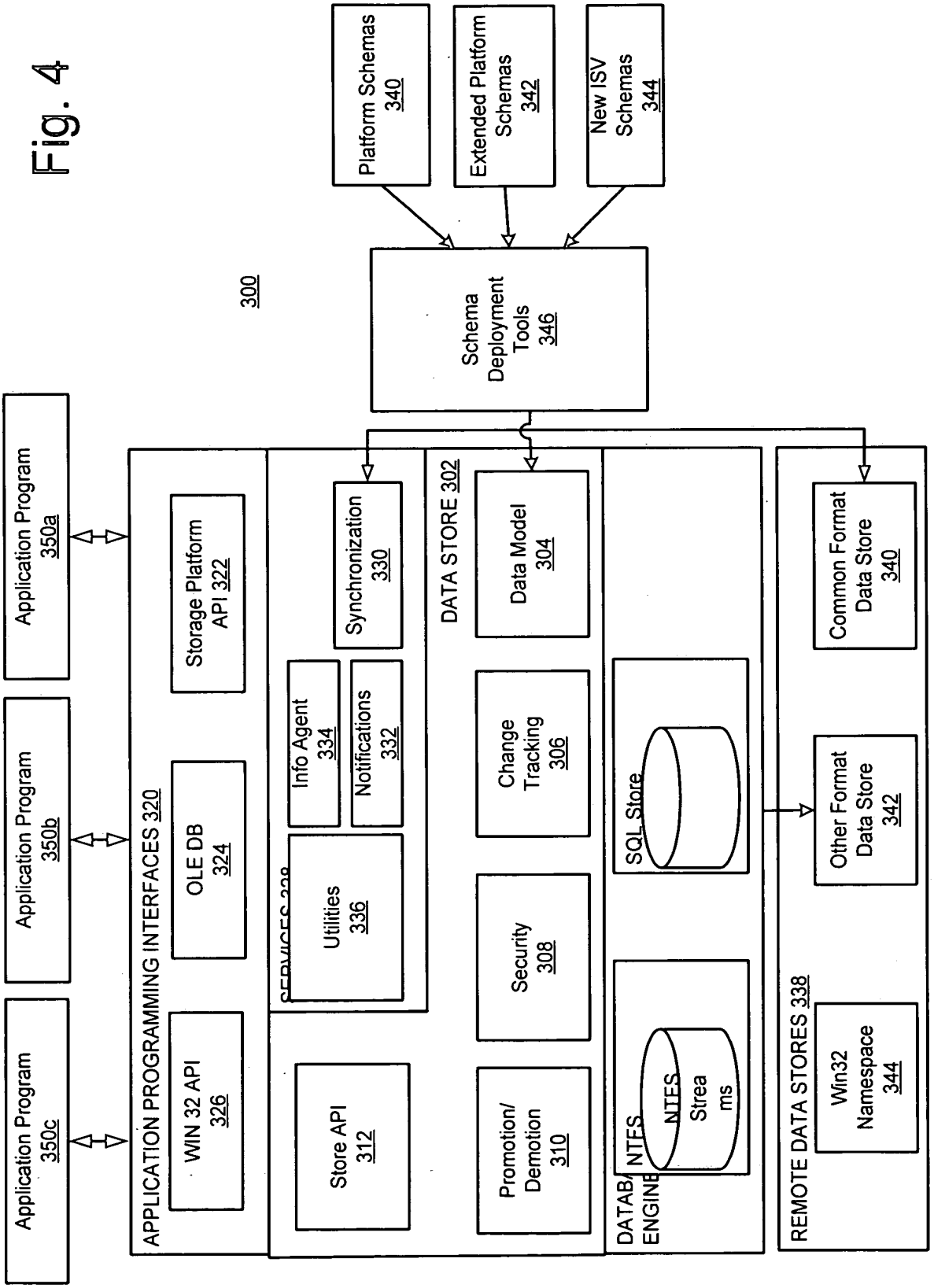

Column Defined as UDT
TABLE
UDT
values of object (*i.e.*, an instance of the UDT) are stored in cell of column

Fig. 3

Fig. 4


300
Platform Schemas 340
Extended Platform Schemas 342
New ISV Schemas 344
Schema Deployment Tools 346
Application Program 350a
Application Program 350b
Application Program 350c
APPLICATION PROGRAMMING INTERFACES 320
WIN 32 API 326
OLE DB 324
Storage Platform API 322
SERVICES 328
Utilities 336
Info Agent 334
Notifications 332
Synchronization 330
DATA STORE 302
Data Model 304
Change Tracking 306
Security 308
Promotion/ Demotion 310
Store API 312
DATABASE ENGINE
NTFS Streams
SQL Store
REMOTE DATA STORES 338
Win32 Namespace 344
Other Format Data Store 342
Common Format Data Store 340

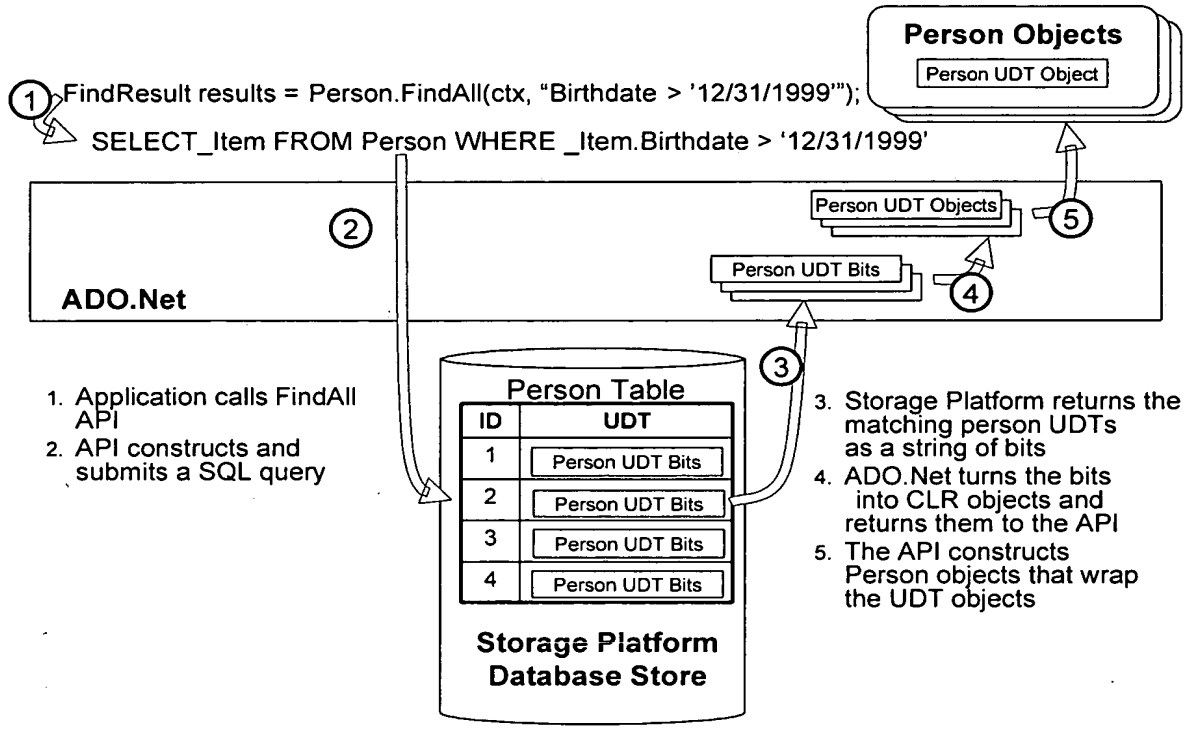


Fig. 5

```
Class Person
{
    [SqlUdtField (IsFixedLength=false; MaxSize = 100)]
    SqlString FirstName;

    [SqlUdtField(MaxSize=SqlMetaData.MAX; IsFilestream=true;)
    SqlBytes PhotoFS;

}
```

Fig. 6

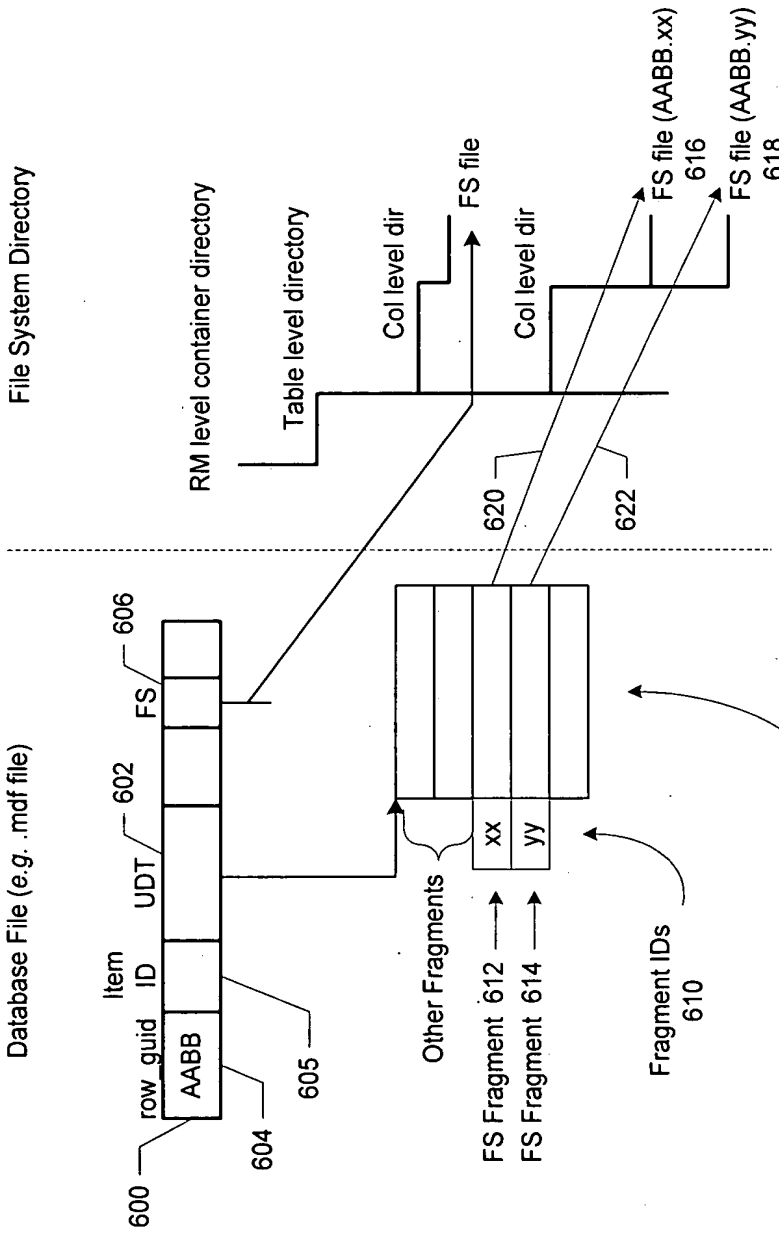

File System Directory
RM level container directory
Table level directory
Col level dir
FS file
Col level dir
FS file (AABB.xx)
616
FS file (AABB.yy)
618
620
622
Database File (e.g. .mdf file)
606
FS
602
UDT
Item
ID
row_guid
AABB
600
604
605
Other Fragments
FS Fragment 612
FS Fragment 614
xx
yy
Fragment IDs
610
Fragments
608

Fig. 7

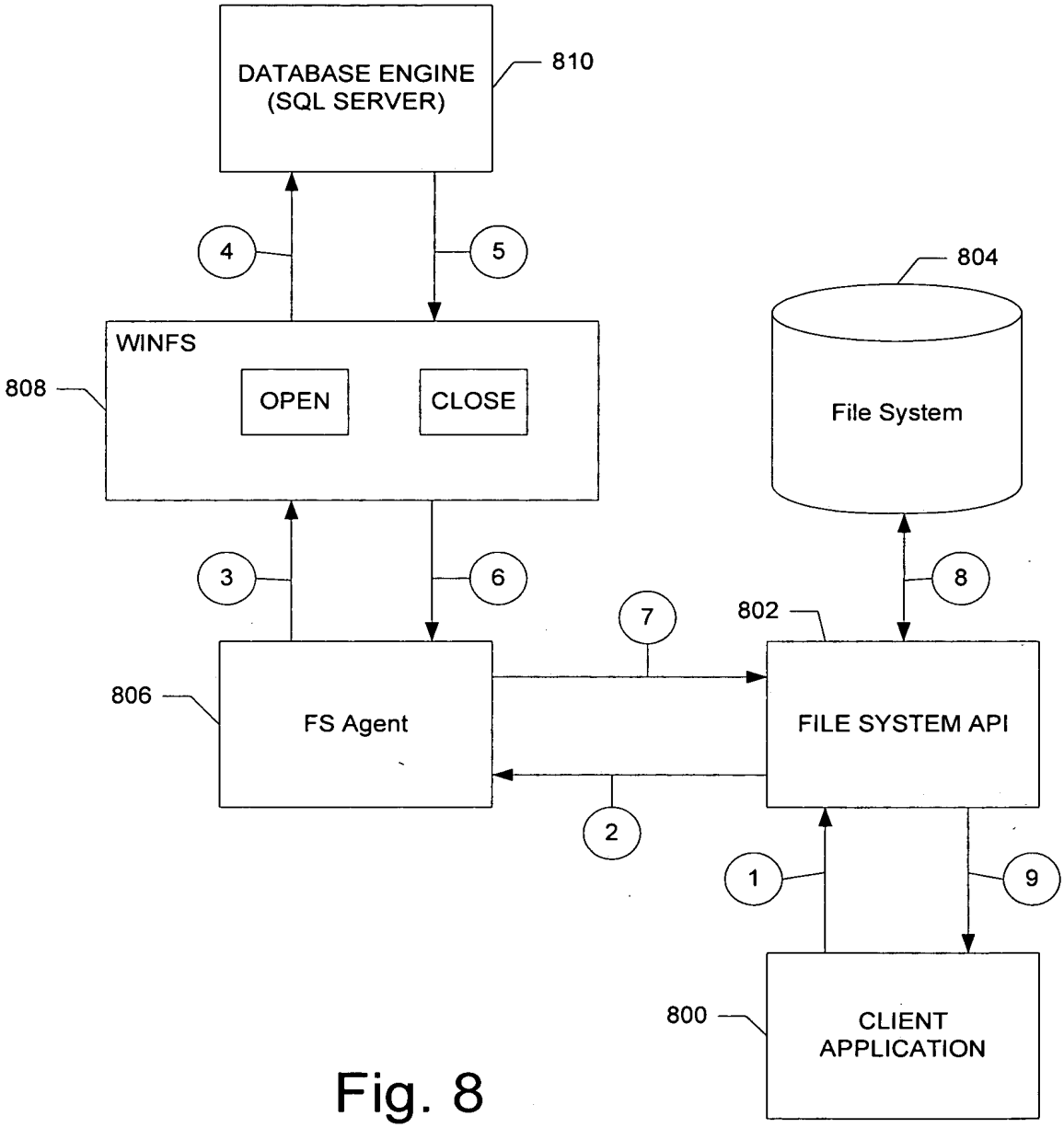

DATABASE ENGINE
(SQL SERVER)
810
4
5
804
WINFS
808
OPEN
CLOSE
File System
3
6
7
802
8
806
FS Agent
FILE SYSTEM API
2
1
9
800
CLIENT
APPLICATION

Fig. 8

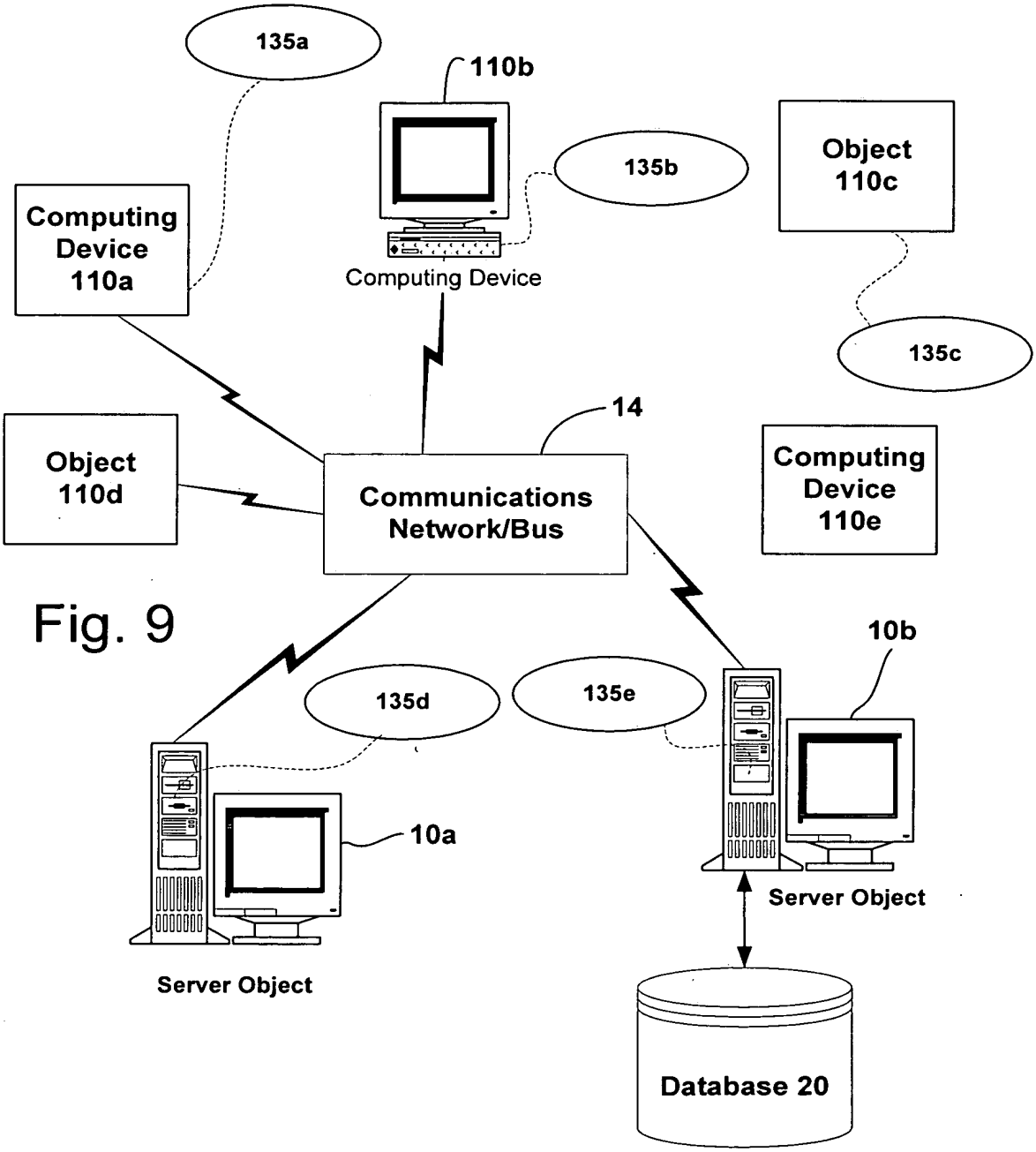

135a
110b
135b
Object 110c
Computing Device 110a
Computing Device
135c
14
Object 110d
Communications Network/Bus
Computing Device 110e
10b
135d
135e
10a
Server Object
Server Object
Database 20

Fig. 9

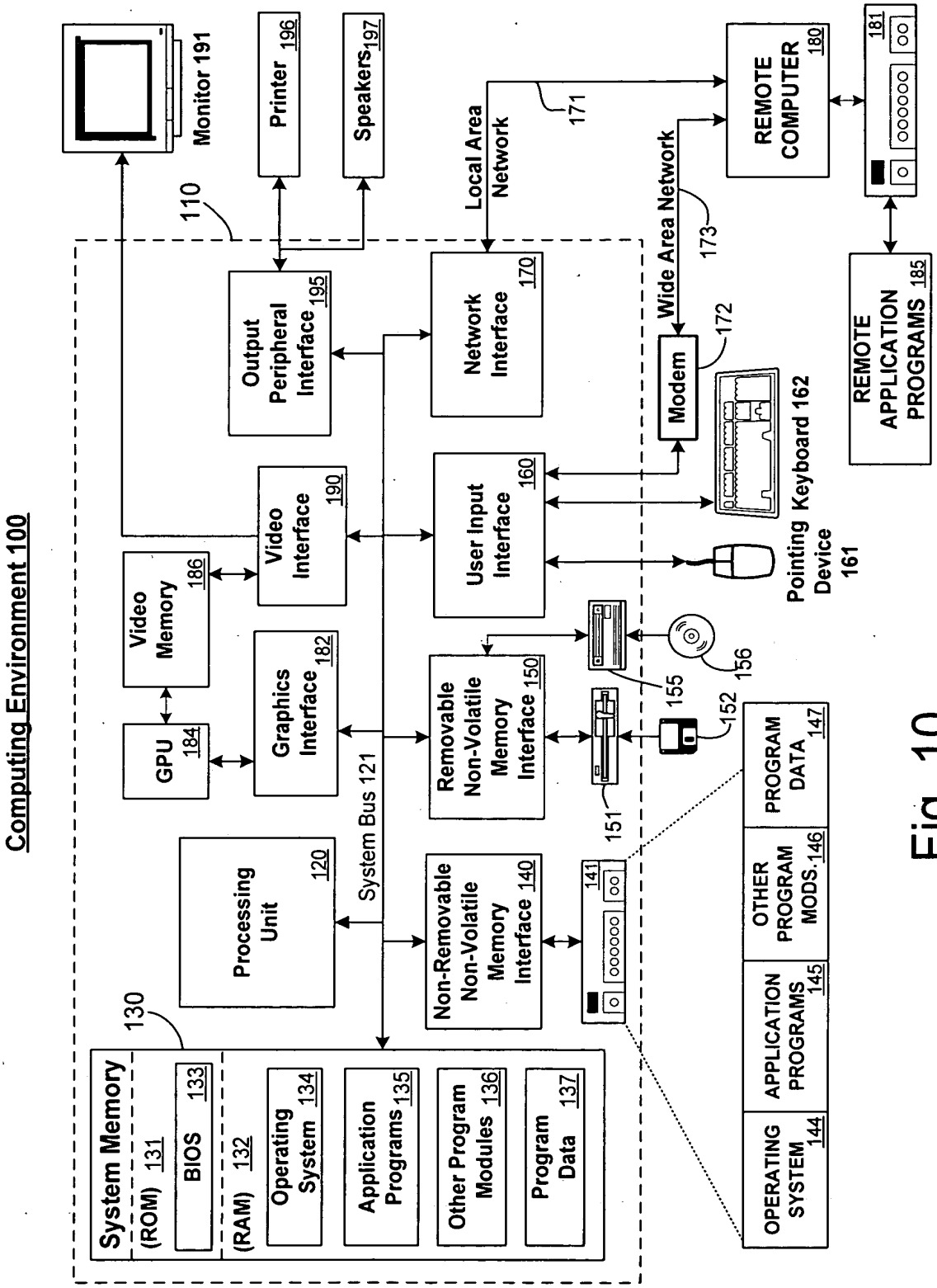

Computing Environment 100
Monitor 191
Printer 196
Speakers 197
110
Local Area Network
171
Wide Area Network
173
REMOTE COMPUTER 180
181
Output Peripheral Interface 195
Network Interface 170
Modem 172
REMOTE APPLICATION PROGRAMS 185
Video Memory 186
Video Interface 190
User Input Interface 160
Pointing Keyboard 162 Device 161
GPU 184
Graphics Interface 182
Removable Non-Volatile Memory Interface 150
155
156
152
151
System Bus 121
Processing Unit 120
Non-Removable Non-Volatile Memory Interface 140
141
130
System Memory
(ROM) 131
BIOS 133
(RAM) 132
Operating System 134
Application Programs 135
Other Program Modules 136
Program Data 137
OPERATING SYSTEM 144
APPLICATION PROGRAMS 145
OTHER PROGRAM MODS. 146
PROGRAM DATA 147

Fig. 10